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Nonalloyed ohmic contacts on GaN using InN/GaN short-period superlattices

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It is well known that ohmic contacts on GaN, a highly promising material for electronic and optoelectronic devices with a wide band gap of about 3.4 eV, constitute a major obstacle to further development of devices based on this material. We demonstrated a novel scheme of nonalloyed ohmic contacts on GaN using a short-period superlattice (SPS), composed of GaN and narrow band-gap InN, sandwiched between the GaN channel and an InN cap layer. Comparison with a similar layer without the SPS structure indicates that quantum tunneling through the SPS conduction band effectively reduces the potential barrier formed by the InN/GaN heterostructure leading to low contact resistivities. From the transmission-line-method measurements, specific contact resistances as low as $6 \times 10^{-5} \Omega \text{ cm}^2$ with GaN doped at about $5 \times 10^{18} \text{ cm}^{-3}$ have been obtained without any post-annealing. Theoretical estimation based on the SPS tunneling model is consistent with the experiment. Applied Physics Letters is copyrighted by The American Institute of Physics.

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